Draft

WORK PLAN
FOR
FOR PRELIMINARY ASSESSMENT/ SITE INVESTIGATION
BALLFIELDS PARCELS
DEPARTMENT OF DEFENSE HOUSING FACILITY (DoDHF)
NOVATO, CALIFORNIA

Contract No. N47408-01-D-8270
Task Order 0063

Prepared for

Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway
San Diego, CA 92132

Prepared by:

Battelle
Environmental Restoration Department
505 King Avenue
Columbus, Ohio 43201

May 19, 2004

APPROVAL PAGE

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Battelle Project Manager: _____ Date: _____
Travis Williamson

Battelle Project Engineer: _____ Date: _____
Regina Lynch

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ACRONYMS AND ABBREVIATIONS

BCT	BRAC Cleanup Team
bgs	below ground surface
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
CCC	California Coastal Conservancy
COPEC	contaminant of potential ecological concern
CSM	conceptual site model
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DEH	Department of Environmental Health
DoD	Department of Defense
DoDHF	Department of Defense Housing Facility
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EFD	Engineering Field Division
FID	flame ionization detector
HAAF	Hamilton Army Airfield
HMX	1,3,5,7-tetranitro-1,3,5,7-tetrazacyclo-octane
IDW	investigation-derived waste
MCL	maximum contaminant level
msl	mean sea level
NFESC	Naval Facilities Engineering Service Center
NGVD	National Geodetic Vertical Datum
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDD	perimeter drainage ditch
PEA	Preliminary Endangerment Assessment
POC	point of contact
PRG	preliminary remedial goal
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
ROC	receptor of concern
ROD/RAP	Record of Decision/ Remedial Action Plan
RWQCB	Regional Water Quality Control Board

SAP	Sampling and Analysis Plan
SHSP	Site Health and Safety Plan
SI	site investigation
SLERA	Scoping-Level Ecological Risk Assessment
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TNT	trinitrotoluene
TOC	Total Organic Content
TPH-D	total petroleum hydrocarbons quantified as diesel range
TPH-G	total petroleum hydrocarbons quantified as gasoline range
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
U.S. EPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
WP	work plan

Section 1.0: INTRODUCTION

A Preliminary Assessment/Site Investigation (PA/SI) for the Ballfields Parcels (108A, 110, 112, 114, 115A, and 117) located at the Department of Defense Housing Facility (DoDHF), Novato, California, is being conducted by the Navy in order to transfer the Ballfields Parcels to the California Coastal Conservancy (CCC) for wetlands reuse in accordance with the *Hamilton Army Airfield Final Reuse Plan* (Hamilton Local Reuse Authority, 1996). The Navy plans to transfer the Ballfields Parcels to the CCC for seasonal wetlands reuse after the Navy confirms that the property does not present an unacceptable threat to human health and/or the environment, and that it is acceptable for its planned future use as a seasonal wetland. A Background Summary report (Battelle, 2004) was prepared to provide a summary of the site history, setting, and previous investigations conducted in the area of the Ballfields Parcels. This initial research identified areas of potential concern (AOPCs) based on a historical records review of the Ballfields Property. These areas are shown on Figure 2-1. Four AOPCs have been identified and can be summarized as follows: (1) five former airplane revetments, (2) spoils piles originating from the Perimeter Drainage Ditch (PDD), (3) the presence of two former ordnance magazines (i.e., Buildings 191 and 193), and (4) the presence of area-wide dichlorodiphenyltrichloro-ethane (DDT) associated with the former Army Base Realignment and Closure (BRAC) property. Samples will be collected from these four areas because these parts of the site are linked to former military activities, and are therefore assumed to be "hot spot" areas with the highest contaminant concentrations. This Work Plan (WP) describes additional data collection that will be performed in support of the PA/SI.

The California Department of Toxic Substances Control (DTSC) issued a *Preliminary Endangerment Assessment (PEA) Guidance Manual* (DTSC, 1994) which was used to prepare this work plan and determine the appropriate level of data collection for the Ballfields Parcels. This report presents all of the available site information that is required under U.S. Environmental Protection Agency (U.S. EPA) guidance for a PA (U.S. EPA, 1991, U.S. EPA, 1992) and DTSC guidance for a PEA. These requirements were used to generate the planning documents for the Ballfields Parcels, including this WP, the Sampling and Analysis Plan (SAP) (Appendix A), Site Health and Safety Plan (SHSP) (Appendix B), and Scoping-Level Ecological Risk Assessment Work Plan (Appendix C).

This work is being performed for the U.S. Navy under Navy Facilities Engineering Service Center (NFESC) Contract No. N47408-01-D-8270, Delivery Order No. 0063, and is funded by the Engineering Field Division (EFD) Southwest in San Diego, CA. The U.S. Navy is the lead agency administrating the investigation of the Ballfields Parcels, and it is Department of Defense (DoD) Policy to achieve site closure with the agreement of local regulatory authorities. The San Francisco Bay Area Regional Water Quality Control Board (RWQCB), DTSC, and California Department of Fish and Game are involved as the local and state regulatory authorities for the project, respectively.

1.1 Work Plan Overview

Included in this WP is a detailed SAP (Appendix A) for the collection of soil and groundwater samples within the AOPCs, a SHSP (Appendix B) that will be adhered to while conducting field activities, and a Scoping Level Ecological Risk Assessment Work Plan (Appendix C). This report is organized in the following manner:

Section 1 Introduction
Section 2 Background Information
Section 3 Sampling and Analysis
Section 4 Soil and Groundwater Data Evaluation
Section 5 References

Section 2.0: BACKGROUND INFORMATION

This section presents all of the available general site background information that is required under U.S. Environmental Protection Agency (U.S. EPA) guidance for a PA (U.S. EPA, 1991, U.S. EPA, 1992) and DTSC guidance for a PEA (DTSC, 1994).

2.1 Site History

The subject site of this report includes Parcels 108A, 110, 112, 114, 115A, and 117 ("Ballfields Parcels") at DoDHF Novato, located approximately 20 miles north of San Francisco in Marin County, CA. In 1932, the U.S. Army Air Corps constructed Hamilton Army Airfield (HAAF) on reclaimed tidal wetland, which had been used as ranch and farm land since the Mexican Land Grant. Military operations began in the area in December 1932. In 1947, HAAF was transferred to the Air Force and renamed Hamilton Air Force Base. The Air Force owned and operated the Base until 1974, at which time it was deactivated. In 1975, residential portions of the Base were transferred to the Navy, and other portions were transferred to the Coast Guard and Army.

The Navy utilized the Ballfields property as a baseball field and open space starting in 1974, until DoDHF Novato (administered by the Navy) was scheduled for closure under the BRAC program in 1994. Prior to the Navy's use of the Ballfields Parcels, the Air Force performed various military functions such as parking aircrafts at revetments for staging and refueling.

2.2 Site Description

The site comprises an area of approximately 18 acres of land bordered by a Coast Guard-owned hillside to the west, a levee and privately owned housing development to the north, and CCC-owned parcels to the south and east (see Figure 2-1). The parcels to the south and east were transferred to the CCC from the Army via an early transfer in September, 2003. The site is located within a 100-year floodplain. The mean daily low and high temperatures are 47ºF and 72ºF, respectively. The average annual rainfall is approximately 21 inches, with approximately 4 to 7 inches of rain per month measured between November and March.

The Navy plans to transfer the Ballfields Parcels to the CCC, as the former Army property and the Navy Ballfields parcels are slated for use in the Hamilton Wetlands Restoration Project. The Navy's Ballfields Parcels are currently unused and overgrown with weeds.

2.3 Hydrogeologic Setting

A description of the hydrogeologic setting at the adjacent former Army BRAC property was presented in the *Main Airfield Parcel Record of Decision/Remedial Action Plan (ROD/RAP)* (CH2MHill, 2003). A summary of that discussion follows.

Three shallow hydrogeologic units occur within the HAAF Main Airfield Parcel and adjacent marsh: fill, soft Bay Mud, and desiccated Bay Mud. The fill originally was used to reclaim the bay margin lowlands for agriculture and has very similar content and hydrogeological properties to the Bay Mud. A different type of fill in the area is the imported construction material used for geotechnical applications and foundation and drainage properties, and is not part of the hydrogeologic unit. This type of fill may be found in pipeline trenches and as a bridging layer beneath some of the formerly developed areas. Permeabilities and groundwater flow characteristics of the hydrogeologic units are summarized below:

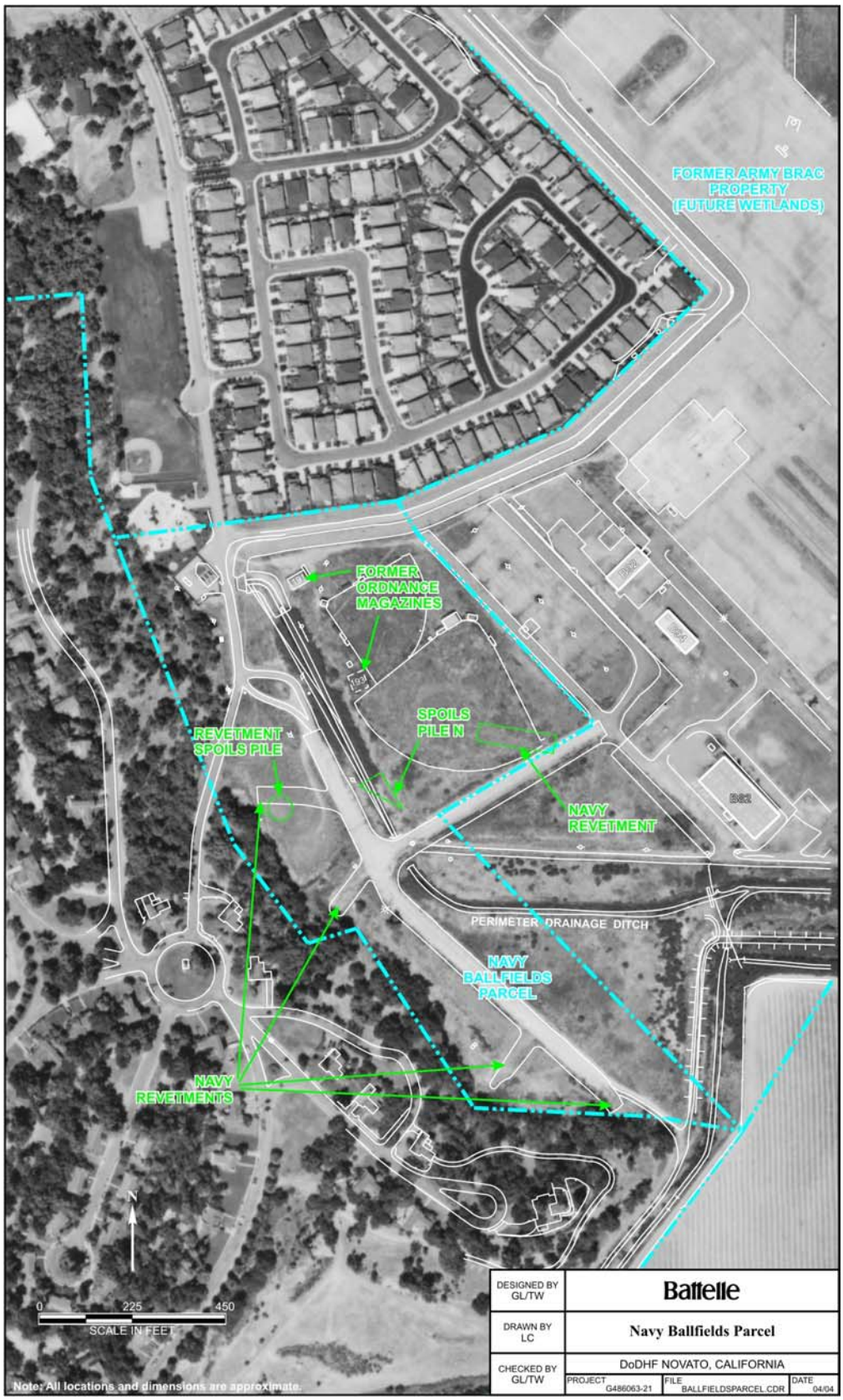

Figure 2-1. Navy Ballfields Parcel

- Fill materials have moderate to low hydraulic conductivities. Preferential groundwater flow through the fill may be controlled by the distributions of different fill types.
- Soft Bay Mud generally has low hydraulic conductivity. Preferential flow, if existent, is probably horizontal and confined to peat layers or shell lenses, which are discontinuous.
- Desiccated Bay Mud has low hydraulic conductivity with some fracture permeability. The desiccation cracks are potentially transient in nature and may heal or infill during periods of saturation.

HAAF is located on the eastern side of the Novato Creek groundwater basin and is part of the regional San Pablo groundwater basin defined by the drainage entering San Pablo Bay. Existing and potential beneficial uses of groundwater within the Novato Creek basin include municipal and domestic water supply, rare and endangered species preservation, freshwater wildlife habitats, and recreational use (RWQCB, 1995). In 1998, the Army conducted a review of well records from the Department of Water Resources and the Marin County Department of Environmental Health, and found that 11 domestic, industrial and irrigation supply wells exist within a two-mile radius of HAAF. Most of these 11 wells are used for domestic or irrigation supply; all are upgradient of the Airfield Parcel and are therefore isolated from site activities. Only one well is located within 1 mile of the airfield (CH2MHill, 2001).

Groundwater beneath the Main Airfield Parcel and adjacent marsh is not now, nor is it likely to be, used for drinking water. State Water Resources Control Board (SWRCB) Policy 88-63 specifies that total dissolved solids (TDS) in excess of 3,000 mg/L renders groundwater unsuitable for drinking. The TDS concentrations in groundwater from monitoring wells across the property range from 819 to 18,270 mg/L with an average TDS concentration of 4,898 mg/L (IT, 1999). These findings indicate that groundwater beneath the Main Airfield Parcel and adjacent marsh is generally unsuitable for drinking.

2.4 Geology

The geologic description of the adjacent former Army BRAC property provided in this subsection originates from the *Comprehensive Remedial Investigation Report* (IT, 1999). HAAF lies within the San Francisco-Marin structural block of the northern Coast Range geomorphic province of California. This Coast Range province is characterized by a series of nearly parallel mountain ranges and intermontaine alluvial valleys that trend obliquely to the coastline in a northwesterly direction. The province consists of geologic units composed of a heterogeneous mixture of metamorphosed igneous and sedimentary rock types and exhibit varying degrees of tectonic deformation. These rocks are grouped together as the Franciscan Complex of Jurassic to Cretaceous age and form the bedrock beneath HAAF. The bedrock is locally overlain by Tertiary alluvium and colluvium deposits. Overlying these geologic units are Quaternary Bay Mud and fill.

It is unknown what exact geologic features exist on the Ballfields Parcels, as no geologic investigation has taken place in this area. However, it is assumed that the geology underlying the Ballfields Parcels is similar to that of the neighboring former Army BRAC property. During site investigation and sampling activities, soil cores will be classified according to lithology.

The higher relief areas to the west and south of the former Army BRAC property are underlain primarily by sandstone of the Franciscan Complex. A clayey, weathered horizon typically overlies the bedrock beneath the Bay Mud deposits. Alluvial/colluvial deposits, composed of sands and silts, are present along the hill slopes and interfinger with Bay Mud in some areas. The Bay Mud, which underlies most of the Bay plain and airfield parcel, is of Quaternary age and typically consists of semiconsolidated to unconsolidated, highly plastic, clayey silt, with microscopic organic matter throughout, as well as discrete lenses and beds of peat and occasional shell fragments. The Bay Mud is

soft and plastic when moist but shrinks, hardens, and becomes brittle when dried. The Bay Mud is stiff and desiccated (cracked) from about 3 ft bgs to a maximum depth of 12 ft bgs ("desiccated Bay Mud"). The desiccated Bay Mud is underlain by saturated Bay Mud ("soft Bay Mud"). The total thickness of Bay Mud increases towards San Pablo Bay and is estimated to be more than 80 ft thick at the eastern edge of the former Army BRAC property.

Fill material overlies the Bay Mud across much of the former Army BRAC property. The fill, consisting of sandy or silty gravel with about 30 percent clay, has an average thickness of 3 ft and a maximum observed thickness of 9 to 10 ft. In general, the fill is thicker near developed areas of the site such as the tarmac, runway, and revetment pad areas. Thickness of the fill in areas of the site away from developed features is typically less than 1 ft.

2.5 Hydrogeology

HAAF is located in the southern portion of the Novato Creek Drainage Basin and Watershed (CH2MHill, 2003). The main slough channel drainage system in the HAAF area drained to the northwest into the tidal reaches of Novato Creek (PWA, 1998), which then drained into San Pablo Bay. Using a system of levees and drainage ditches, the area that is now HAAF was reclaimed for agricultural use in the late 1800s.

Surface water flow is generally from the upland areas in the west toward San Pablo Bay in the east. From areas west of HAAF, Pacheco Creek and Arroyo San Jose carry surface water along the northwestern boundary of HAAF. Both Pacheco Creek and Arroyo San Jose discharge into the Ignacio Reservoir, which occupies approximately 120 acres and has a storage capacity of 480 acre-ft (JSA, 1998b). The reservoir drains into Novato Creek through a levied channel with a flap-gate outlet located at the Bel Marin Keys Boulevard Bridge.

A man-made PDD runs along three sides of the former Army airfield to convey discharge from the City of Novato's stormwater discharge facility located just north of the Ballfields Parcels to the San Pablo Bay. A short, concrete-lined, 1,200 ft section of the 17,500-ft PDD is located on the Navy Ballfields parcels. The PDD, which originates on the Ballfields Parcels, experiences intermittent flow from the stormwater discharge facility, which may cause minor pooling of surface water; however, these pools are temporary and do not support a sustainable habitat for aquatic wildlife.

2.6 Land Use

The 18.37 acres of Navy Ballfields Parcels is currently characterized as a terrestrial, grassland habitat with some developed areas (JSA, 1998b). It is comprised of weedy upland plants such as yellow star thistle and wild radish, as well as grasses such as barley, ryegrass, and tall fescue. Because this area is fragmented by old service roads and the entire parcel encompasses a relatively small area, the quality of wildlife habitat is considered moderate (IT, 1999). The area provides foraging habitat for terrestrial species such as the California vole, raccoons, black-tailed deer, burrowing owls, and northern harriers. Based on biological surveys conducted by the Army BRAC Program and the Coastal Conservancy on the HAAF property, there are no threatened or endangered species or habitats located in the area (Jolliffe, 2004).

The *Hamilton Wetland Restoration Plan-Final Environmental Impact Report/Environmental Impact Statement* (JSA, 1998b) states that the Navy Ballfields Parcels will be restored into a seasonal wetland area. This will be achieved by the reuse of suitable dredged material as fill, or cover, and the breach of nearby levees to flood the land. Dredged materials used in the wetland will be suitable for upland beneficial reuse and will comply with regional wetland cover material guidelines as defined by the

San Francisco Bay RWQCB (RWQCB, 2000). Using dredged material, the rate of marsh development will be accelerated, making habitat more readily available to fish, wildlife, and species dependent on marsh for survival. The emergent habitat will be part of 570 acres of restored wetlands that are valued for their scarcity and benefit to federally listed threatened and endangered species (JSA, 1998b). In addition, a public access trail will run adjacent to the Navy Ballfields Parcels, along the western hillside of the parcel and the northern New Hamilton Partners levee. Figure 2-2 shows the draft proposed wetlands design for the site.

Current elevation of the Ballfields Parcels is generally between 0 and 3 feet below sea level (JSA, 1998a). According to the *Hamilton Wetlands Restoration Plan – Feasibility Study*, an elevation of +6 to +8 feet national geodetic vertical datum (NGVD) 1929 is necessary to establish a seasonal wetland. It is inferred that the amount of fill on the Ballfields Parcels, therefore, will be between 6 and 9 feet. This area will typically not be flooded by the tides. There will be a channel through the seasonal wetlands habitat that will convey the waters discharged from the City of Novato storm water pumping plant located in the northwest corner of the site. The exact design grade of this channel has not yet been determined; however, the channel will likely evolve to be nontidal in the area composing the Ballfields Parcels.

Although more than 600 acres of land near the Ballfields Parcels will be converted into a wetlands area, not all wetlands areas will support the same ecological habitat. It is noteworthy that the 18 acres composing the Ballfields Parcels is planned to become a seasonal wetland, with a significant portion of the property not influenced by tidal action. This means that ecological receptors selected to evaluate risk-based screening levels for COPCs on former Army BRAC program may not be appropriate when evaluating the Navy's Ballfields Parcels.

2.7 Areas of Potential Concern

As documented in the Background Summary report (Battelle, 2004), several areas of potential environmental concern were identified during a historical records review of the Ballfields Property: The four AOPCs at the Ballfields Parcels include:

- Five former revetments areas, used in the 1940s for airplane refueling and maintenance;
- Two spoils piles dredged from the perimeter drainage ditch (PDD);
- Area-wide dichlorodiphenyltrichloroethane (DDT) applied on the base; and
- Buildings 191 and 193, used for ordnance storage; Building 193 was possibly also used as a transformer switch station.

A CSM developed in the Background Summary report (Battelle, 2004) is presented here as Figure 2-3. The flowchart shows the potential sources of hazardous substances that might be present at the Ballfields Parcels, release mechanisms, and pathways that could result in exposures to human or ecological receptors. Potential sources of hazardous materials that are included in the CSM consist of the four AOPCs. Air, groundwater, soils, surface water, and sediments pathways are incorporated into the CSM to show which exposure routes may be potentially significant for human or ecological receptors.

Site descriptions and results of previous environmental investigations associated with these four AOPCs are summarized below. A more detailed account of the areas and investigations performed is provided in the Background Summary report (Battelle, 2004). Using the CSM, in conjunction with an in-depth evaluation of the historical data, helps focus future environmental investigations at the site.

2.7.1 Former Airplane Revetments. There were five revetments located on Navy property that were constructed sometime in the late 1930s or early 1940s (Figure 2-4). Based on aerial photos, it appears that these revetments were actively used from 1943 until 1946 for activities such as aircraft

parking, maintenance, and fueling. It is not known if the revetments were paved or unpaved because they are currently abandoned and overgrown and such detail was not discernable in aerial photos. Throughout the years, the City of Novato has disposed of landscaping and construction debris (including leaves, wood chips, palm fronds, soil, gravel, logs, scrap lumber, asphalt, corrugated metal, and concrete) in the area of some of the former revetments. Representatives from the City of Novato have indicated that the landscaping and construction debris will be removed from the area before fieldwork occurs in the summer of 2004.

Although environmental investigations have not been conducted specifically at the revetments located on Navy property, multiple investigations have been conducted for former Army revetments located on HAAF property. Because the Army revetments were also used for aircraft refueling and maintenance activities, environmental concerns identified at these revetments are expected to be similar in nature to those potentially existing on Navy revetments. Therefore, results of the Army revetment investigations are summarized here to identify the types of chemicals likely to be present at Navy revetments.

For the investigations of the Army revetments, soils around and beneath the revetments were analyzed for total petroleum hydrocarbons (TPH) quantified as diesel range (TPH-D) and gasoline range (TPH-G), oil and grease, metals, volatile organic compounds (VOCs), and polynuclear aromatic hydrocarbons (PAHs). Metals (especially lead, cadmium, copper, and barium), select PAHs, and petroleum hydrocarbons were detected in soils near most of the Army revetments. Groundwater was collected at eight of the Army revetments and analyzed for metals, petroleum hydrocarbons, VOCs, and PAHs. Metals were consistently detected in groundwater at all revetments, but organics were only detected in two revetments (PAHs in groundwater were detected at a revetment used as an engine test pad and at a revetment used for firefighter training).

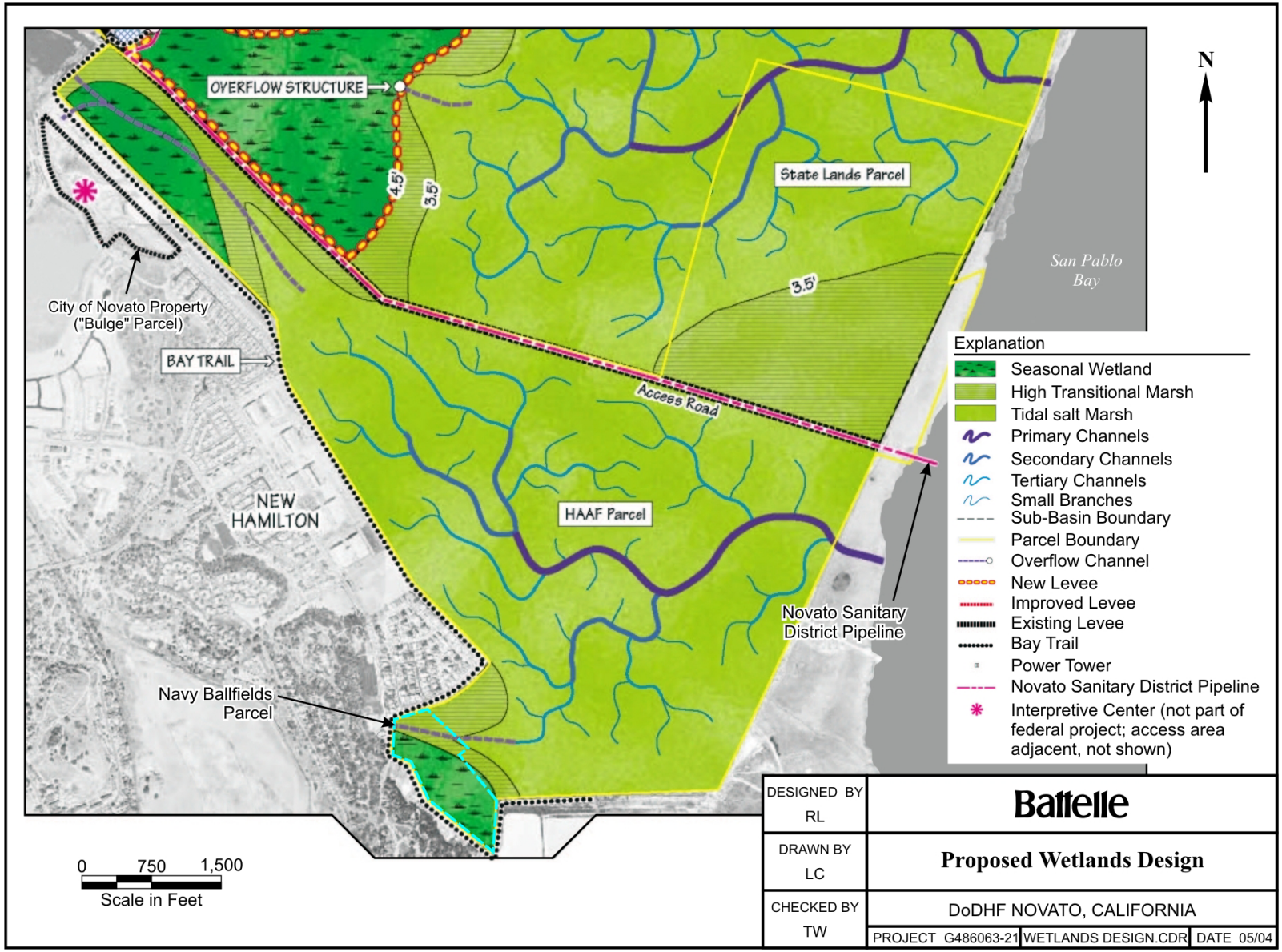

Figure 2-2. Proposed Wetlands Design

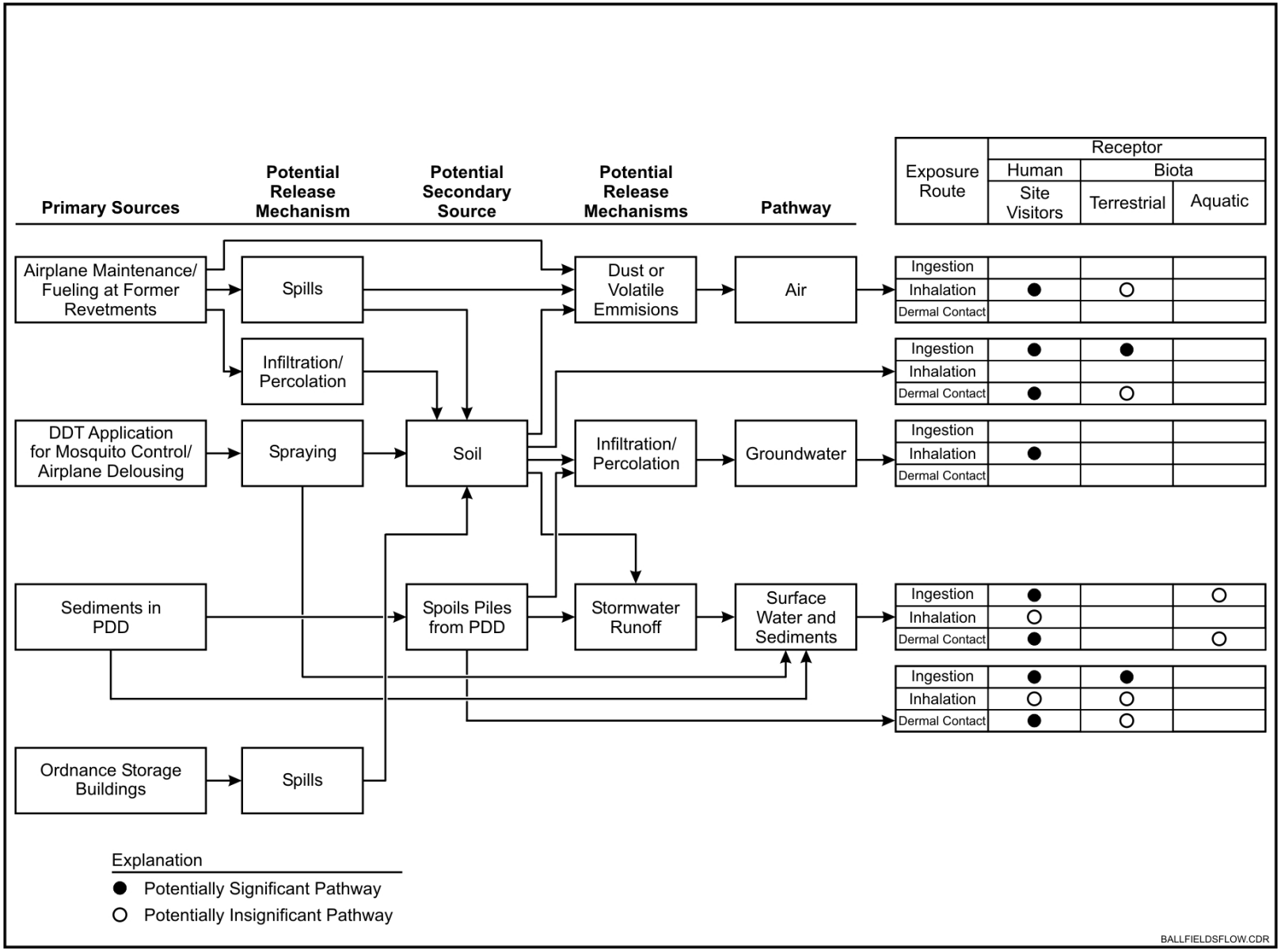

Figure 2-3. Conceptual Site Model

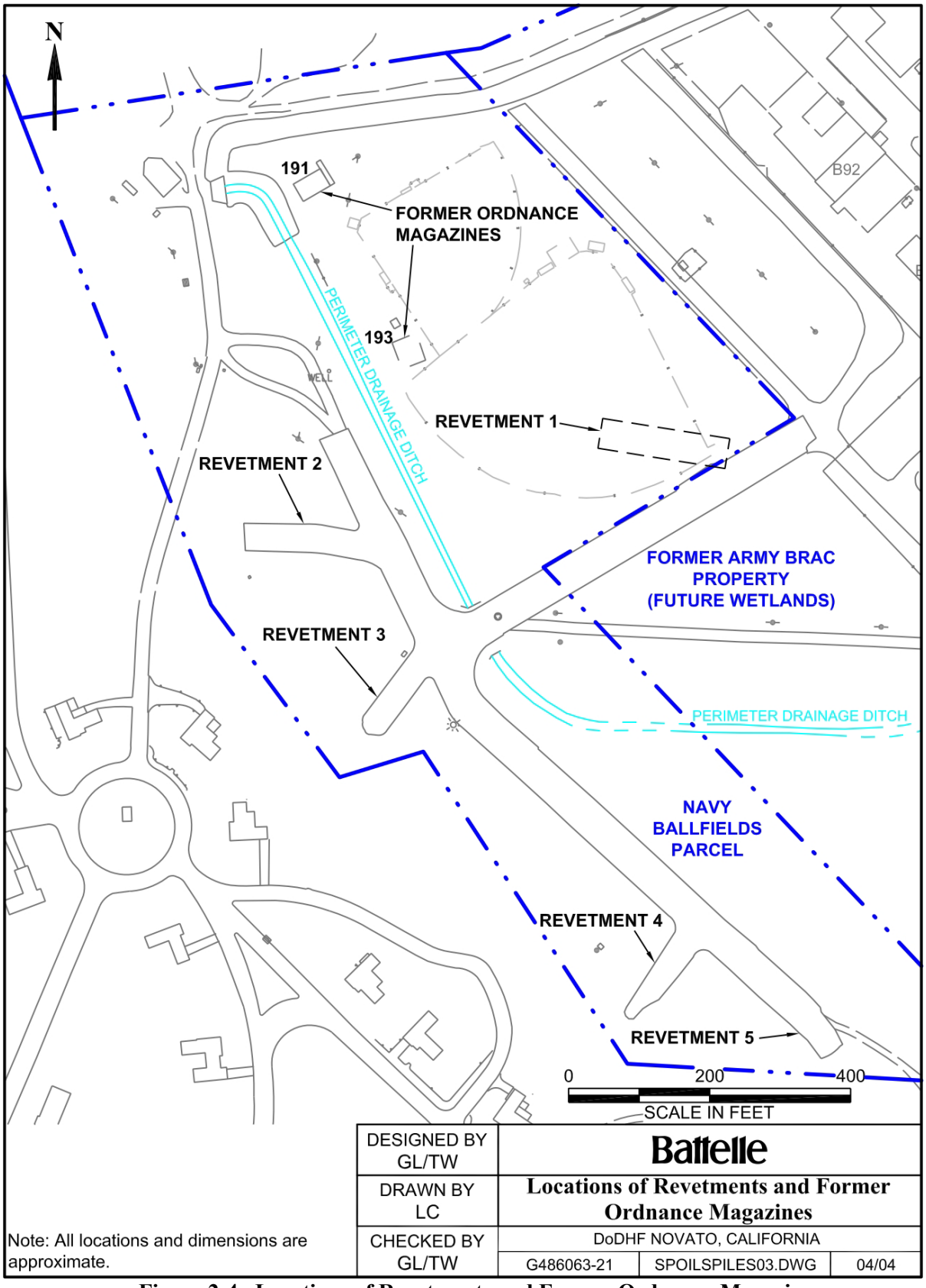

Figure 2-4. Locations of Revetments and Former Ordnance Magazines

2.7.2 Spoils Piles. The PDD is a constructed drainage channel that encircles all but the western margin of the former runway area of HAAF. It was designed to convey surface water runoff to pump stations for lifting and discharge into an outfall drainage ditch and San Pablo Bay. The PDD originates on the Ballfields Parcels and conveys water from portions of the former Army BRAC property as well as from privately owned agricultural lands adjoining the airfield. Approximately 13,500 feet of the PDD is lined with concrete, and 4,000 feet of the PDD is unlined. The entire portion (1,200 feet) of the PDD on the Navy Ballfields Parcels is lined, and its location can be seen in Figure 2-5. The PDD is not considered an AOPC because 1) a large portion of the water flow comes from a permitted stormwater discharge facility operated by the City of Novato, and 2) all sediments and vegetation were removed to the concrete lining in 1998. Additionally, water flow in the PDD is intermittent, providing a marginal or nonexistent habitat for ecological receptors. The PDD was periodically dredged to improve flow, and the material removed was typically piled at the edge of the PDD. These spoils piles are generally composed of vegetation and sediments. Two spoils piles, Spoils Pile N and the Revetment Spoils Pile, exist on the Ballfields Parcels and originated from the PDD. The approximate locations of these spoils piles can be seen in Figure 2-5.

Spoils Pile N

Spoils Pile N was composed of sediments and vegetation dredged from the PDD in February 1995. In April 1995, during the Additional Environmental Investigation (WCC, 1996), Spoils Pile N was sampled and analyzed for metals, PAHs, oil and grease, benzene, toluene, ethylbenzene and xylenes (BTEX), TPH-G, and TPH-D. Metals (lead, cadmium, beryllium, and zinc) were detected above baseline levels established by the Army. As a result of these detections, soil was removed from the footprint of the pile down to the approximate original grade during the 1998 Interim Removal Action (IT, 2000) and disposed of in an offsite Class II facility. Confirmation sampling at 0.5 to 1 ft bgs detected total DDT at a maximum of 0.088 ppm and lead at a maximum of 57.5 ppm (see Figure 4). Table 2-1 shows the minimum and maximum values for lead and DDT at Spoils Pile N.

Table 2-1. Lead and DDT Concentrations at Spoils Pile N

Chemical	Number of Samples	Minimum Value (ppm)	Maximum Value (ppm)
Lead	3	16.5	57.5
Total DDT	3	0.0357	0.0880

Revetment Spoils Pile

An additional spoils pile was identified on the Ballfields Parcels in early 1995 near the northern-most Navy revetment (see Figure 2-5). The additional spoils pile was also composed of material dredged from the PDD, but the time of dredging is unknown. In April 1995, one sample was collected and analyzed for metals, PAHs, oil and grease, TPH-D, and TPH-G. Although several metals and PAHs were detected, only lead and benzo(a)pyrene, were detected above EPA region 9 residential or California-modified PRGs (WCC, 1996). No further action or investigation of the Revetment Spoils Pile has been taken since 1995.

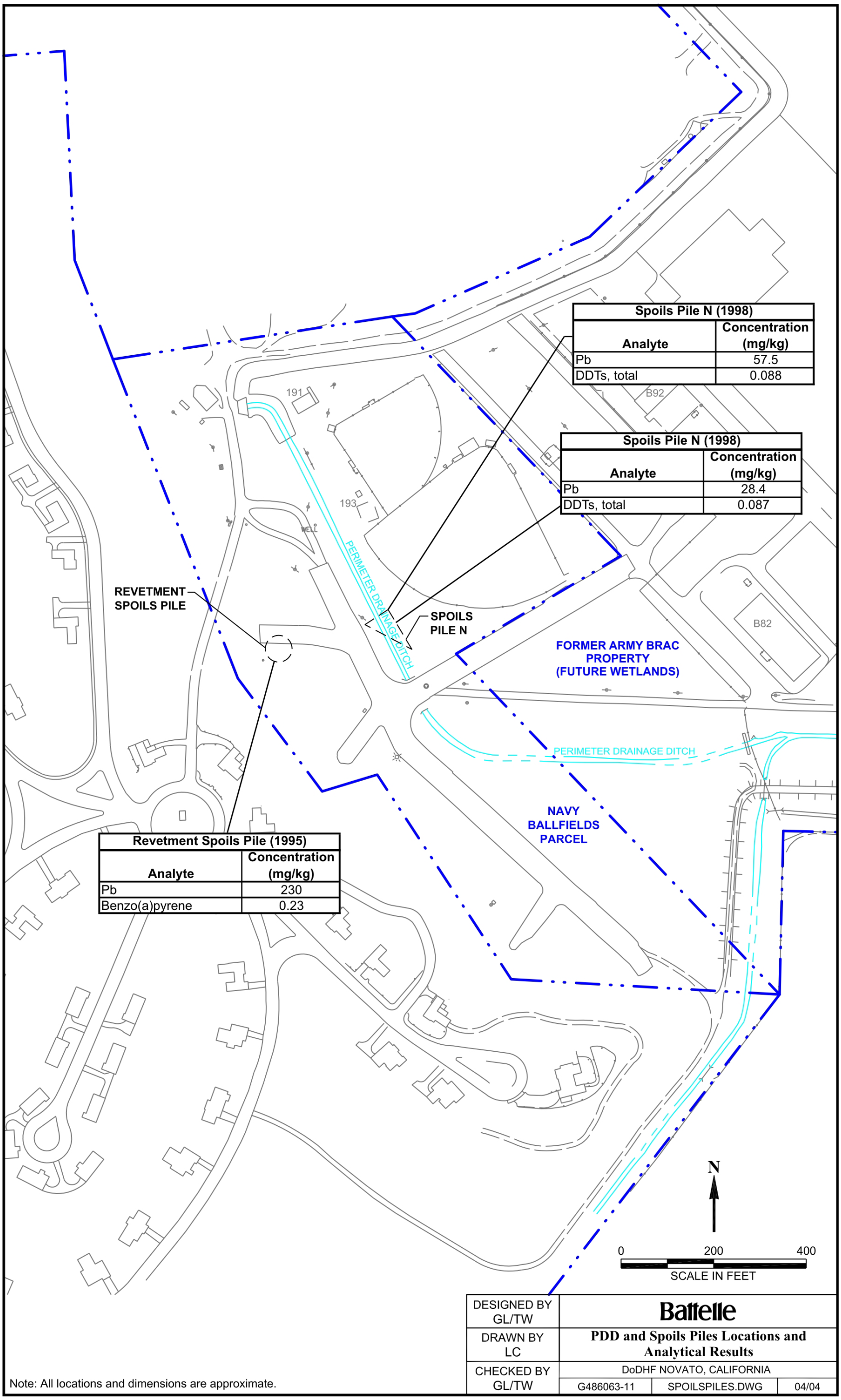

Figure 2-5. PDD and Spoils Piles Locations and Analytical Results

2.7.3 Ordnance Magazines. Buildings 191 and 193 were built on the Navy's Ballfields Parcel in 1934. Building 191 was built to be a Loading Building Magazine, and Building 193 was designated a Primers and Detonators Magazine (War Department, 1934). Given that building lists are the only known source of information regarding ordnance use, no information about the type of ordnance and/or handling procedures used at Buildings 191 and 193 has been identified. Some information is available about more recent uses of the buildings, including use of Building 193 as a transformer switch station and Building 191 as a staging area for little league baseball teams (ERM, 1995). The locations of Buildings 191 and 193 are shown in Figure 2-4.

Building 191 was demolished by the Costal Conservancy in March 2004. The building was a 1,200-square-foot, single-story, windowless concrete block building located on Parcel 112 with corrugated metal roofing and a concrete foundation. It had two large roof vents, heavy steel doors, and loading docks, and was formerly used as a magazine for storage of arms and ammunition (ERM, 1995). The building was demolished to the concrete foundation and the area was cleared of all debris.

Building 193 was a 120-square-foot, single-story, windowless brick building on Parcel 114, with a wood-frame roof and concrete floor. Building 193 was formerly used as a transformer vault and switch station as well as an arms and ammunition storage building (ERM, 1995), and was demolished sometime between 1997 and 2004 (based on visual observations).

The former ordnance magazines (Buildings 191 and 193) were used for storage of arms and ammunition, not for manufacture or assembly. It is likely that the ordnance was packaged and remained unopened during storage; it is therefore reasonable to assume that no release of ordnance materials occurred in the areas of Buildings 191 and 193. Planned sampling activities at the ordnance buildings were cancelled in 1997 after a BRAC Cleanup Team (BCT) site walk determined that the buildings were in good condition, with no cracks or staining, and a lack of evidence that ordnance had impacted the site (PRC and U&A, 1997).

There is no reason to believe that unexploded ordnance (UXO) has impacted the site, and no visible sign of UXO is

2.7.4 Area-Wide DDT Issue. This section includes a summary of information associated with the presence of the insecticide DDT and its breakdown products (dichlorodiphenyldichloroethylene [DDE] and dichlorodiphenyldichloroethane [DDD]) in the vicinity of HAAF. According to Army investigations, DDT was used extensively by the military after 1943, mostly to control mosquitoes on Base and delouse aircraft that flew in from tropical regions. An investigation performed by the Army BRAC Program in 1999 (IT, 1999) determined that elevated levels of these insecticides might be present at portions of the airfield.

In March and October 2003, the Army Corps of Engineers conducted an area-wide DDT investigation (USACE, 2003a). The investigation focused on determining the total DDT concentrations in surface and subsurface soils throughout the airfield area. Using a grid approach, samples were collected from a total of 116 locations (Figure 2-6) over approximately 600 acres, or 1 sampling location per 6 acres). Of the 116 locations that were sampled, one had total concentrations of DDT above 1 ppm.

Figure 2-6 shows that three samples collected by the Army in 2003 were located within the Ballfields Parcels (SO-86, SO-87, and SO-88) (USACE, 2003a). This sample coverage calculates to 3 locations over approximately 18 acres, or 1 sampling location per 6 acres. Table 2-2 gives the depths and DDT concentrations at each location. These results show that higher concentrations of DDT are present in the shallow soils, while samples collected below the surface have much lower concentrations of DDT. The highest concentration of DDT in soils is 0.0651 ppm (USACE, 2003a).

Table 2-2. DDT Concentrations on Navy Ballfields Parcels

Sample Name	Depth (inches bgs)	Total DDT (ppm)
SO-86	Surface-2	0.0184
	6-8	0.0112
	14-16	0.004
	22-24	0.0008
SO-87	Surface-2	0.0651
	6-8	0.0075
	14-16	0.001
	22-24	0.001
SO-88	Surface-2	0.0398
	6-8	0.0103
	14-16	0.0033

Based on the previous sampling, DDT and its breakdown products DDE and DDD are present in soil on the Navy's Ballfields Parcels. Both surface and subsurface soil are likely secondary source media for these types of constituents. Because of the strong adsorption properties of DDT, it is very unlikely that the chemical would have leached to groundwater.

Although the WP and Scoping Level Ecological Risk Assessment WP will characterize current site conditions, it is noteworthy that a Record of Decision developed for the nearby former Army property (CH2MHill, 2003) describes a scenario where fill material containing DDT concentrations between 0.024 and 0.93 ppm will be placed on the Ballfields Parcels as part of the proposed seasonal wetland design. This fill material would be required to meet concentration guidelines for either wetlands foundation or wetlands cover, depending on the final design of the proposed seasonal wetland. However, because a significant amount of fill material is required to complete the wetlands design, it is likely that some material excavated from the former Army property could be used as the foundation of the seasonal wetlands on the Ballfields Parcels. The San Francisco Bay RWQCB *Draft Staff Report, Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (RWQCB, 2000) gives values for wetlands foundation materials with DDT concentrations up to 0.046 ppm. Based on the ecological risk assessment approach described in Appendix C, DDT concentrations currently present on the Ballfields Parcels do not present a risk to ecological receptors of concern.

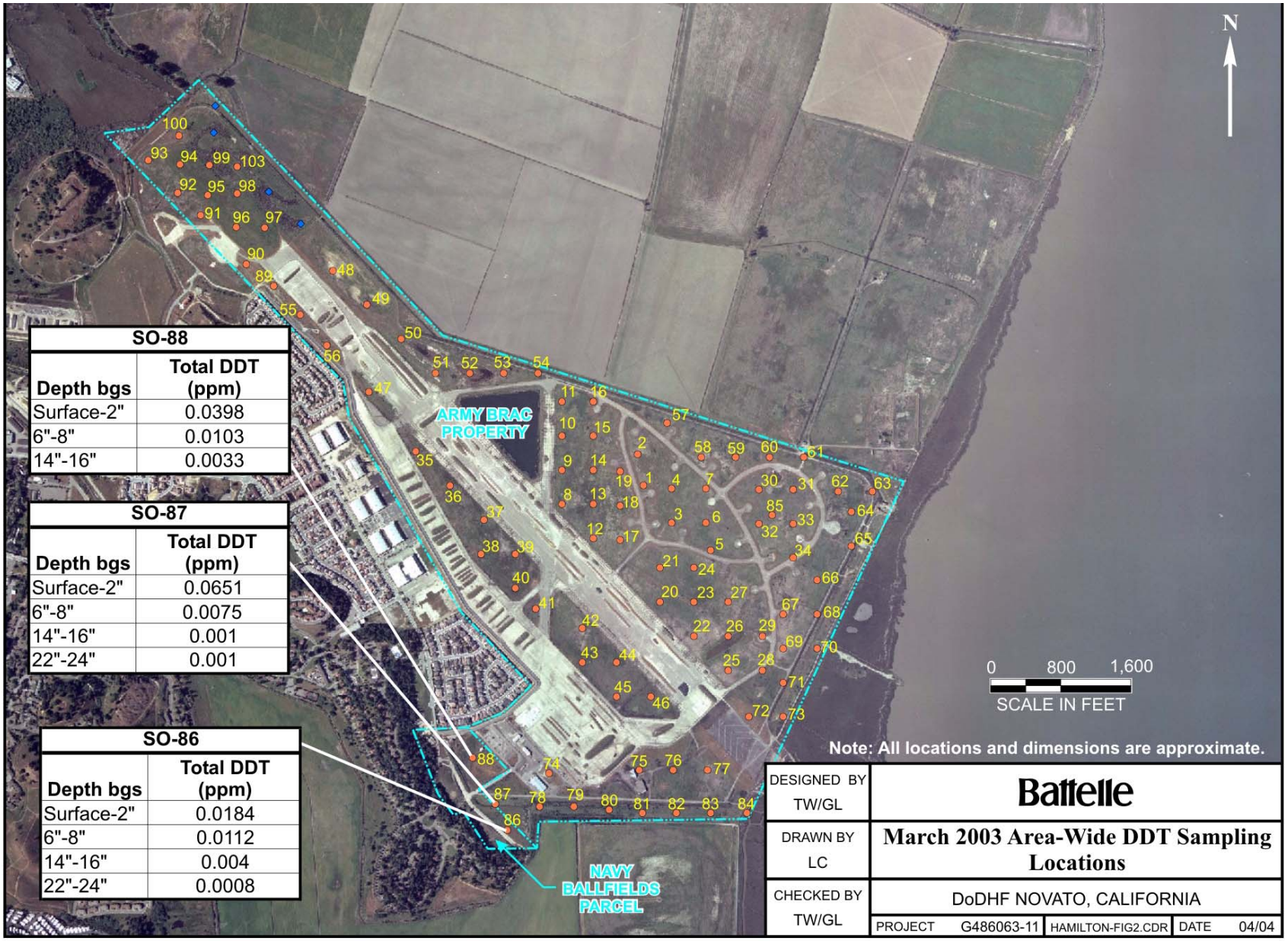

Figure 2-6. March 2003 Area-Wide DDT Sampling Locations

Section 3.0: SOIL BORINGS AND GROUNDWATER SAMPLING

3.1 General Sampling Approach

Based on the available data collected during the Background Summary Report (Battelle, 2004), Battelle has developed a sampling approach for identifying potential environmental impacts at each of the AOPCs. The main objective of this additional sampling effort is to collect enough analytical data to assess the environmental condition at the site, and to determine whether ecological or human receptors may be exposed to unacceptable risks due to historical site activities.

3.2 Number of Samples and Locations

The AOPCs at the site are described in Section 2.7. In order to investigate these four areas, and fill in data gaps that exist in the historical data, both soil and groundwater samples will be collected. Sampling needs were determined using the conceptual site model (Figure 2-3) to further examine the data requirements for evaluating risk to potential receptors. The rationale for determining the number of samples and laboratory analyses that will be performed on these samples is described in the following section. Table 3-1 describes the number of samples and analyses that will be performed.

Table 3-1. Details of Sampling Plan

Location	Sample Matrix	Number of Sample Locations	Total Number of Samples	Analyses
Navy Revetments	Soil	5 per revetment	50 (5 locations, 2 depths, 5 revetments)	TPH-D, TPH-G, PAHs, RCRA metals, TOC, Grain Size Distribution
	Groundwater[(b)]	1 per revetment	5 (5 revetments)	TPH-D, TPH-G, PAHs, RCRA metals, VOCs
Spoils Piles	Soil	5 per spoils pile	20 (5 locations, 2 depths, 2 spoils piles)	PAHs, RCRA metals, TOC, Grain Size Distribution; DDT will be analyzed in one soil sample collected at Revetments Spoils Pile.
	Groundwater[(b)]	1 per spoils pile	2	PAHs, RCRA metals
Former Ordnance Magazines	Soil	1 per building	4 (2 locations, 2 depths)	Explosives[a], TOC, Grain Size Distribution; total PCBs will be analyzed in one soil sample collected at Bld 193
	Groundwater[(b)]	1 per building	2	Explosives[(a)]
TOTAL	**Soil**	**36[(c)]**	**72[(c)]**	**-**
	Groundwater[(b)]	**9**	**9**	**-**

RCRA metals: As, Ba, Cr, Cd, Pb, Se, Ag, Hg TPH-G: TPH gasoline range TOC: total organic content
PAHs: polynuclear aromatic hydrocarbons VOCs: volatile organic compounds
PCBs: polychlorinated biphenyls

(a) Explosives will be analyzed using EPA Method 8330, which will detect fourteen common explosives, including 2,4,6-trinitrotoluene (2,4,6-TNT), nitrobenzene, and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX).
(b) Groundwater will be analyzed only if adequate sample volume can be collected. Groundwater will be collected just below the water table.
(c) One soil sample location near Revetment 2 and the Revetments Spoils Pile will be used for both locations.

3.2.1 Navy Revetments. The five Navy Revetments have not been sampled in the past, but information about the results of sampling on the Army's revetments has been used to develop this sampling strategy. The Navy intends to collect five (5) soil samples from each Revetment, at two discrete depths. It is expected that five sampling locations per revetment will provide representative data regarding the type and concentration of contaminants that may be present. Based on the results of sampling conducted at the Army revetments, the types of chemicals likely to be present in soil at the Navy revetments include TPH-D, TPH-G, PAHs, and metals. Both surface and subsurface soil are likely secondary source media for the types of constituents that may be present. The soil samples collected will be analyzed for TPH-G, TPH-D, PAHs, eight Resource Conservation and Recovery Act (RCRA) metals, total organic carbon (TOC), and grain size distribution (surface samples only for TOC and grain size). This suite of analytes will allow the Navy to determine if the revetments contain unacceptable levels of contaminants which may negatively impact ecological or human receptors.

In addition to the soil samples, groundwater will be collected from each revetment. One soil boring location per revetment will be used to collect a groundwater sample. Constituents in soil, metals in particular, may have leached to groundwater from the soils above. Chemical transport in groundwater, however, is not likely due to the low permeability of the native Bay Mud deposits. Also due to the low permeability of the Bay Mud present in the area, it is uncertain whether it will be possible to collect adequate groundwater to analyze for all of the chemicals of interest. Assuming that a large enough volume of groundwater can be collected, the groundwater will be analyzed for TPH-G, TPH-D, PAHs, RCRA metals, and VOCs.

3.2.2 Spoils Piles. Based on the results of historical sampling activities conducted at the Spoils Piles, and because the piles originated in the PDD, the types of chemicals likely to be present in soil are PAHs, RCRA metals, and DDT. Both surface and subsurface soils are likely secondary source media for these types of constituents. The Navy plans to advance five (5) soil borings in each of the two spoils piles, and collect soil samples from the surface and from one depth. These soil samples will all be analyzed for PAHs and RCRA metals. The samples (surface and subsurface) collected from one location at the Revetments spoils pile will also be analyzed for DDTs (note that DDT analyses already exist for Spoils Pile N [see Figure 2-5]). This location will be analyzed for DDT because historically, elevated concentrations of DDT have been detected in sediments dredged from the PDD, and the Revetments spoils pile has not been analyzed for DDT in the past. In addition to analysis for contaminants of potential concern, surface soils from the spoils piles will be analyzed for TOC and grain-size distribution.

Constituents in soil, metals in particular, also may have leached to groundwater. Although chemical transport in groundwater is not likely due to the low permeability of the native Bay Mud deposits, one groundwater sample will be collected from one soil boring at each spoils pile. Assuming that adequate sample volume will be available, given the low permeability of the Bay Mud, the groundwater samples will be analyzed for PAHs and RCRA metals.

In March and October 2003, the Army Corps of Engineers conducted an investigation of area-wide DDT (USACE, 2003a). The investigation focused on determining the total DDT concentrations in surface and subsurface soils throughout the airfield area. Samples were collected from a total of 116 locations over approximately 600 acres, or 1 sampling location per 6 acres. Of the 116 locations that were sampled, three were located on Navy property, corresponding to a density of approximately 1 sampling location per six acres in the Ballfields Parcels. Although the DDT concentrations reported are well below EPA's residential soil PRGs for humans, their potential toxicity to ecological wildlife must be determined.

3.2.3 Former Ordnance Magazines. Based on historical documentation regarding the uses of Buildings 191 and 193, it is possible that ordnance residues have impacted the soils. However, there is no historical or current data that would indicate the presence of unexploded ordnance (UXO) at the site; nor has any indication of the presence of UXO been observed during site visits. Both surface and subsurface soils are likely secondary source media for explosives residues. The Navy plans to advance one soil boring at each building, and collect both surface and subsurface samples to be analyzed for explosives residues. EPA Method 8330 will be used for this analysis, which tests for fourteen (14) commonly used explosives, including 2,4,6-trinitrotoluene (2,4,6-TNT), nitrobenzene, hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), and tetryl. In addition, it is possible that polychlorinated biphenyls (PCBs) are present in soil. The samples collected from Building 193 will be analyzed for total PCBs because it was formerly used as a transformer vault. Surface soil samples collected from the former ordnance buildings will also be analyzed for TOC and grain-size distribution.

Although it is unlikely that explosives residues have impacted the areas near Buildings 191 and 193, the Navy plans to collect one groundwater sample from each soil boring location, and analyze it for explosives residues using EPA Method 8330, assuming that adequate sample volume is available. Groundwater will not be analyzed for PCBs, because PCBs strongly adsorb to soil, making it very unlikely that PCBs would have leached to groundwater.

3.3 Field Sampling Activities

The sampling activities will include the advancement of approximately thirty-six (36) soil borings at the site. Approximately nine (9) of the soil boring locations will be used to collect groundwater samples. In addition, all borings at each AOPC will be continuously cored to investigate changes in lithology.

In most cases, soil samples will be collected both at ground surface and at one depth below ground surface. The depth of the subsurface soil sample will be determined during sampling, based on the physical appearance of the soils. If soils appear to be stained or impacted in any part of the core, the subsurface sample will be collected from the affected depth. If no visible staining or other indication of contamination is observed, the subsurface soil sample will be collected at approximately 1 foot below ground surface (bgs). Table 3-1 shows the number of samples to be collected from each AOPC. Soil and groundwater sampling techniques and analyses are described in detail in the SAP (Appendix A).

3.3.1 Pre-Boring Activities. A site inspection will be conducted near each boring location to locate and identify underground utility indicators, such as surface-mounted manholes, valve boxes, utility vaults, meter boxes, surface meters, water hydrants or spigots, or other riser appurtenances. In addition, survey results conducted by the Army in 2002 will be consulted to identify the locations of any underground utilities. Detailed subsurface utility inspections will also be performed at each site by a private contractor. The conclusions from each underground utility clearance will be used to confirm or modify the proposed locations of soil borings.

Test boring permits will be obtained from the Marin County Department of Environmental Health (DEH) before soil boring activities begin. In addition, a qualified surveyor working under the supervision of a California-licensed professional surveyor will perform surveying activities to identify the location and elevation of proposed sampling locations. Survey equipment will be calibrated in accordance with the manufacturer's recommendations. The survey will be conducted in conjunction with a review of historical aerial photos and maps to ensure that samples are collected in the correct locations.

3.3.2 Soil and Groundwater Sampling. A licensed drilling contractor will be contracted to advance the soil borings for each of the site assessments. The contractor will have the appropriate current certificates, experience, and training. It is anticipated that a direct-push Geoprobe™ sampling technique will be used for this effort.

Soil borings will be advanced in the approximate locations identified in Figure 3-1. Soil samples will be collected from each boring at both the surface and at one depth below ground surface, as described in the SAP (Appendix A). In addition, groundwater samples will be collected from selected soil boring locations that are identified as the most likely to be impacted by chemicals based on field observation and monitoring.

An experienced field geologist under the supervision of a California-certified geologist will classify the soil lithology. The field geologist will visually inspect, classify, and log the subsurface soil samples retrieved from the boreholes according to the Unified Soil Classification System (USCS).

A portable photo ionization detector (PID) will be used to monitor the field crew's breathing zone for volatile hydrocarbons. During boring advancement and sampling activities, the PID will be used to screen soil samples for residual hydrocarbon products. Organic vapors above the open boreholes will be monitored during the borehole advancement process. The PID will be calibrated daily or when conditions warrant recalibration. Battelle's site-specific worker SHSP (Appendix B) will be followed for all of the field activities.

3.3.3 Disposal of Investigation-Derived Waste.

Solid Waste All drill cuttings removed from individual boreholes will be placed directly into 55-gal Department of Transportation (DOT)-approved steel drums or soil bins. The containers will be labeled with the following information: date, project name and number, generator name, point of contact (POC), applicable contact numbers, contents of drum, and the boring identification number. These containers will be stored in the fenced yard near former underground storage tank (UST) site 957/970 for no longer than 60 days, prior to proper disposal. Proper disposal procedures will be determined based on the analytical results from soil samples collected from the respective boreholes.

Liquid Waste Equipment decontamination processes will generate wastewater. In addition, wastewater will be produced from groundwater sampling activities. Wastewater will be collected in drums and/or tanks, labeled with the location and date(s) of collection, POC, and the POC's phone number. Containers will be stored in the fenced yard near former UST site 957/970. The method for wastewater disposal will be determined based on the groundwater analytical results from groundwater monitoring wells. All wastewater will be transported off site and disposed of by a certified waste-handling contractor.

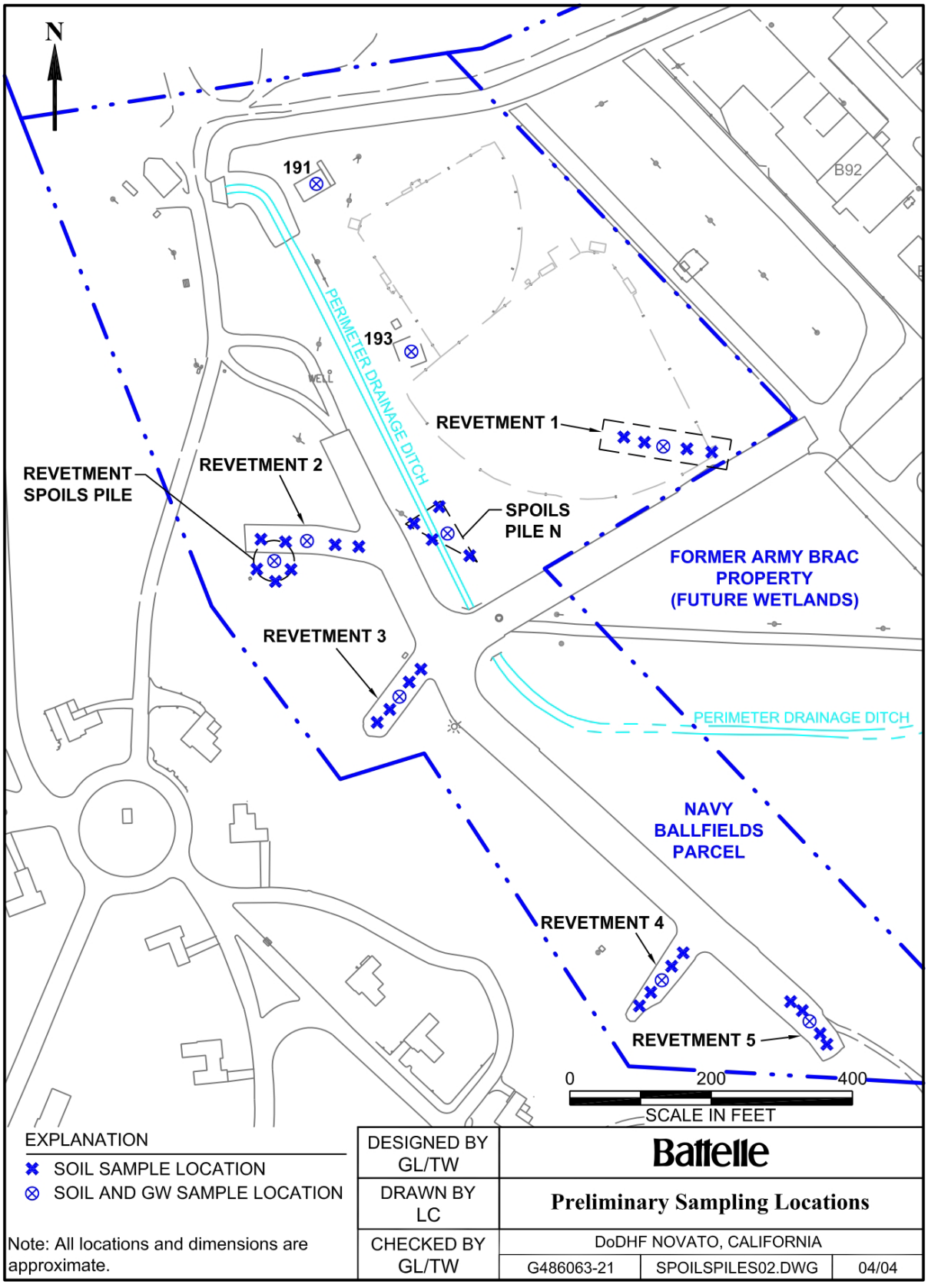

Figure 3-1. Sampling Locations

Section 4.0: SOIL AND GROUNDWATER DATA EVALUATION

This section includes a summary of the general approach that will be used during this investigation to evaluate the AOPCs. Samples will be collected, as described in Section 3, and analyzed to determine the concentrations of contaminants. These concentrations will be evaluated in terms of human health and ecological risk to potential receptors.

4.1 Human Health Screening Assessment

A tiered human health screening approach will be used to evaluate existing and new chemical data to assess the potential for adverse effects to human health resulting from exposure to chemicals in soil at the Ballfields Parcels under current conditions. Chemicals detected in soil samples collected from AOPCs will be screened pursuant to the following protocol:

1. The first tier screening assessment will conservatively compare maximum detected soil concentrations to U.S. EPA Region 9 2002 residential preliminary remedial goals (PRGs). Chemicals will be retained for further evaluation (i.e., more site-specific screening assessment) based on the following criteria:

    - Retain analytes with maximum detected concentration greater than Region 9 residential PRGs (U.S. EPA, 2002);
    - Retain detected analytes that are reasonably linked to previous land uses, and for which there are no PRGs; and,
    - Comparison of nondetected concentrations to soil PRGs, retain analytes for further evaluation if the maximum reported detection limit exceeds the PRG.
    - Analytes will be considered for exclusion based on low frequency of detection, or if analyte is not detected but retained due to the lack of data to evaluate the adequacy of detection limits. Any such exclusions would be clearly identified and considered in the uncertainty analysis of the risk assessment step.

2. For chemicals retained for further evaluation, a more site-specific screening approach will be conducted. Because the current use of the Ballfields Parcels is not residential (nor will it be residential in the future) a more reasonable exposure scenario (e.g., trespasser or recreational receptor) will be used to derive risk-based screening levels. The specific receptors and exposure parameters that will be used to derive the site-specific screening levels will be discussed with and agreed upon by DTSC. The screening process will be conducted using maximum as well as 95% upper confidence level (UCL) of the mean concentrations and will follow the methodology used to calculate PRGs. Based on historical data and previous sampling results for this site, it is not anticipated that chemicals will be retained for further evaluation after this second screening assessment; however, if this is not the case, further evaluation of chemicals remaining after the second screening will be evaluated in a site-specific risk assessment conducted in accordance with U.S. EPA and DTSC guidance.

U.S. EPA Region 9 tap water PRGs will be used to evaluate the results of groundwater sampling. Because the only potentially complete exposure pathway for human receptors at the site is through inhalation, and it is not likely that a trespasser or recreational receptor will come into contact with groundwater, this will be a very conservative screening value.

4.2 Ecological Risk Assessment

An ecological risk assessment will be conducted using existing and new chemical data from the Ballfields Parcels to evaluate the potential for adverse effects to ecological receptors resulting from exposure to contaminants in soil under current conditions. To evaluate these potential risks, multiple guidance manuals were considered: DTSC's 1996 *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities*; U.S. EPA's 1992 *Framework for Ecological Risk Assessment* and 1997 *Ecological Risk Assessment Guidance for Superfund*; and the Navy's 2001 *Guidance for Conducting Ecological Risk Assessments*. DTSC is the lead regulatory agency for the Navy's Ballfields Parcels; therefore, the ecological risk assessment approach (described in Appendix C of this Work Plan) will closely follow DTSC and Navy guidance.

A phased approach will be followed for the ecological risk assessment at the Ballfields Parcels. The first phase consists of the scoping level ecological risk assessment (SLERA), which includes the development of a CSM, identification of contaminants of potential ecological concern (COPECs), receptors of concern (ROCs), and potential exposure pathways. If the results of the scoping assessment indicate that ecological receptors may be exposed to contaminants present at the site, either directly or indirectly, then a Phase I predictive assessment will be conducted. Conservative exposure assumptions are made for ROCs and COPECs in a Phase I predictive assessment to estimate risk to biota at the site. If the Phase I assessment indicates that a Phase II validation study is warranted, assumptions used to estimate risk to exposed biota in Phase I will be refined and validated, where necessary, with site-specific sampling data. After the Phase II study, a Phase III impact assessment can be conducted to assess the severity and extent of population and community effects as input to the evaluation of remedial alternatives and refinement of remediation goals (DTSC, 1996). It is expected that the ecological risk assessment for the Ballfields Parcels will proceed through the SLERA and into the Phase I predictive assessment.

The overall objectives of the ecological risk assessment activities for the Ballfields Parcels are to:

1. Conduct an ecological risk assessment to evaluate potential risks associated with exposure to COPECs detected in soil samples from the Ballfields Parcels (note that both existing data and data collected during future sampling activities will be considered in the ecological risk assessment);

2. Determine if additional assessments are warranted and, if so, identify any additional data needs to support the assessments; if the Phase I predictive assessment concludes that the current condition of the Ballfields Parcels do not present an unacceptable risk to ecological receptors, no further action will be recommended with respect to protection of the environment;

3. Conduct additional ecological assessments, if required.

The following sections describe the recommended approach for conducting the ecological risk assessment at the Ballfields Parcels.

4.2.1 SLERA. This section describes the methodology for conducting a scoping level ecological risk assessment based on potential exposure of ROCs to COPECs. The scoping level ecological risk assessment includes development of a CSM, identification of COPECs and ROCs, and identification of potential exposure pathways. The CSM that has been developed for the Ballfields Parcels is shown in Figure 2-2.

COPECs will be developed for the Ballfields Parcels by evaluating existing data, and collecting new data where necessary. The analytes detected in soil samples collected from the Navy revetments, spoils piles, and former ordnance magazines will be examined pursuant to the following protocol:

1. Compilation of a list of conservative soil screening benchmark values, protective of plants, including the following sources: *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (RWQCB, 2004), Oak Ridge National Laboratory Toxicological Benchmarks (Efroymson et at., 1997), as well as toxicity databases such as PHYTOTOX, 1996, and relevant toxicity studies in the literature when relevant toxicological data are not readily available.

2. Comparison of maximum detected sediment concentrations to the identified benchmarks, and retain or exclude according to the following:

   - Retain analytes with maximum detected concentration greater than the benchmark;
   - Retain detected analytes that are reasonably linked to past land uses, and for which there are no benchmarks; and,
   - Retain all detected analytes reasonably linked to past land uses that are on the Region 9 list of bioaccumulative substances (Hoffman, 1998).

3. Comparison of nondetected concentrations to the conservative benchmarks, and retain as part of the COPEC list if the maximum reported detection limit exceeds the benchmark. Exclude if maximum detection limit is below benchmark.

4. Use of professional judgment to evaluate those constituents that are retained to this point. Analytes are considered for exclusion if seldom detected, or not detected but retained due to the lack of benchmarks to evaluate the adequacy of detection limits. Analytes are considered for exclusion when no ecological benchmarks exist, there are no known Navy sources, or there is unlikely to be a significant pathway to ecological receptors. Any such exclusions would be clearly identified and considered in the uncertainty analysis of the risk assessment step.

The ROCs that have been identified at the Ballfields Parcels were selected based on the likelihood of the species occurrence at the site; significance of the species to ecosystem function; availability of toxicity and life history data; and species sensitivity to expected COPECs. In addition, the ROC selection has considered species of special concern within California. Because it is impractical to assess exposure to all potentially exposed species within a trophic group, representative species were selected as conservative surrogates for exposure to a group of taxonomically related and ecologically similar receptors. The species selected as ROCs include the raccoon, northern harrier, burrowing owl, and American robin.

Terrestrial wildlife may be exposed to chemical contaminants through three major pathways: inhalation, dermal contact, and ingestion. Exposure through inhalation for ecological receptors is considered minor due to the blocking effect of heavy vegetation on the site. Dermal exposure to soil contaminants for birds and mammals, although likely to occur, is considered to be minimal because the ROCs have significant fur or feathers to protect skin from contaminants. Groundwater has historically not been considered a significant pathway for contaminant transport at HAAF because of the extremely low hydraulic conductivity of the Bay Mud that underlies the site (IT, 1999). Therefore, inhalation, dermal

contact, and groundwater ingestion pathways will not be considered in this ecological risk assessment. The primary route of exposure for the ROCs is associated with ingestion of contaminated prey and direct /incidental ingestion of soil, and for all ROCs, this exposure pathway appears to be complete.

4.2.2 Phase 1 Predictive Assessment. If the scoping assessment indicates that COPECs may directly or indirectly contact ecological receptors through a complete exposure pathway, it is necessary to conduct a Phase 1 predictive assessment. To evaluate potential risks from the complete exposure pathways to ROCs at the Ballfields parcels, a prey-chain model will be developed. Dose estimates will be calculated for all COPECs detected in soils sampled in the Ballfields parcels and for the receptors of concern. A more detailed description of the methodology used for the ecological risk assessment is presented in Appendix C.

4.2.3 Preliminary Phase 1 Predictive Assessment for DDT. The general approach of the ecological risk assessment described above indicates that there are complete exposure pathways to ROCs at the Ballfields Parcels. A preliminary assessment was conducted to evaluate the potential ecological risks from DDT exposures at Spoils Pile N and the Ballfields Parcels to assist in the development of the field sampling plan. Based on the ROCs and methodology described previously for the SLERA (Section 4.2.1), a preliminary assessment was conducted. The results are presented here; for a detailed account of methodology and calculations, please see Appendix C of this work plan.

The results of calculations executed to evaluate risk to ROCs indicate that all of the hazard quotients (HQs) for all ROCs were less than 1.0, which means that the DDT concentrations detected in soils at the Ballfields Parcels are at concentrations where adverse effects are not likely to occur. These results also indicate that DDT concentrations that exist in soils at the Ballfields Parcels will pose little or no risk to ecological receptors. The HQs for Spoils Pile N based on conservative exposure parameters for all receptors ranged from 5.7×10^{-5} to 0.40. Similarly, for the DDT concentrations measured by the Army Corps of Engineers in 2003 in the Ballfields Parcels area, the HQs based on conservative exposure parameters ranged from 5.1×10^{-5} to 0.30. These results indicate that DDT concentrations present in site soils do not pose a significant risk to ecological receptors at the Ballfields Parcels and do not warrant additional sampling for DDT. Note that current sampling design does include one additional DDT sampling location in the area of the revetments spoils pile, which has not been investigated for DDT in the past (see Appendix A for more information about sampling and rationale). After this data has been collected, the DDT result will be compared to those evaluated in this preliminary assessment to ensure no significant risk exists for ecological receptors at the Ballfields Parcels

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